NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Innovation for Our Energy Future

Process for Safe, Efficient Laser Service Subcontractor Work

2014 DOE LSO Workshop

Lawrence Livermore National Lab

Presenter:

Deana Luke
Health & Safety Manager
Alternate Laser Safety Officer

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Safe, Efficient Subcontractor Service Work

- Process used to prepare for laser technician service visit
- **Developed and used at National Renewable Energy Laboratory (NREL)**
- Best Practice #166, DOE EFCOG Laser Safety Subgroup *http://www.efcog.org/bp/p/166.htm*
- **Incorporates an Integrated Safety Management System (ISMS) approach**

Why Pre-plan for Laser Servicing Visits?

Laser Servicing and Maintenance presents unique hazards and elevated risk

- **Open beam tasks**
- **Energized electrical hazards**

Subcontractor's laser safety program may lack rigor required at your site:

- **Laser eyewear requirements**
- **Training**
- **Safe Practices**

Set expectations & address issues upfront

Provide efficient, predictable and consistent approach for service visits

Challenges with Laser Service Work

Eyewear Considerations

-Is selection of eyewear appropriate for wavelengths and OD requirements for laser systems being serviced?

-Alignment eyewear vs. more conservative eyewear

-Condition of eyewear

-International Challenges (IEC labeling for OD)

Challenges with Laser Service Work – Energized Electrical Hazards

- Energized diagnostics should be performed only if there is no exposure i.e. no exposed conductors and low voltage work (<50 v)

- Procedures for de-energizing capacitors

- NFPA 70E Requirements
  - Most laser techs don't have this training
  - Prohibit this work on site.

Challenges with Laser Service Work –

Work Practices

Alignment procedures

- **Technicians remove eyewear to see beam**
- **Beam-locating devices not always available**
- **Insufficient use of beam blocks**
- **Shiny tools**

Challenges with Laser Service Work – Training

Technicians not trained

-Laser Safety

-Familiarity with hazards of system they are servicing

- NFPA 70E

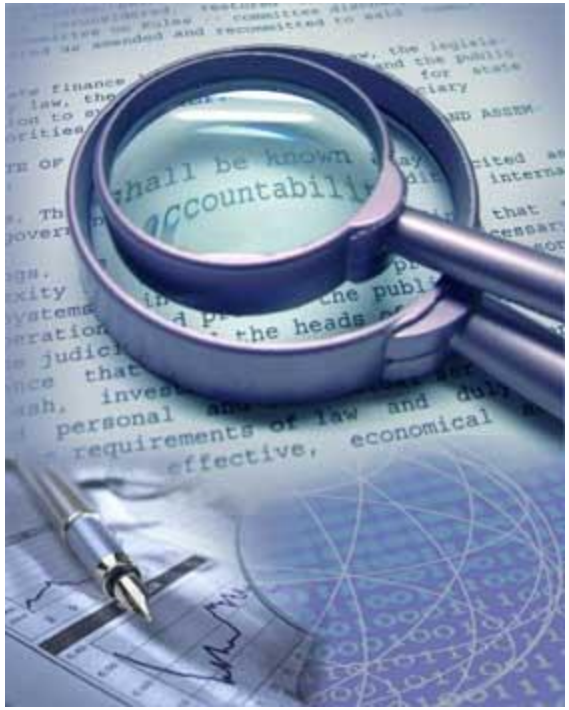
Multistep Oversight of Technician's Work

Before they arrive – **verification**

Before they lift a tool – **orientation**

While they're working – **hosting**

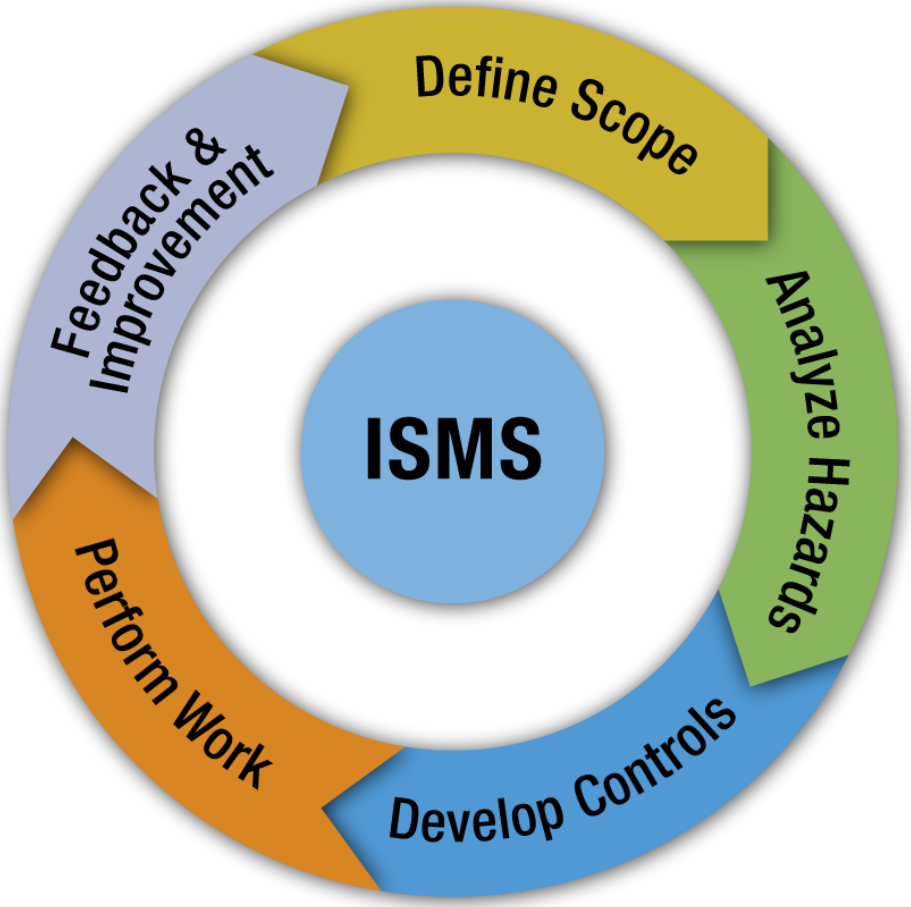
Before they leave – **critique**



ISMS in Laser Servicing

Define the Scope –

- What
- Who (credentials)
- Where
- Live diagnostics (energized)
- Open beam
- Duration of the work



Analyze the hazards

Open beam work?

- MPE
- OD

Energized diagnostics?

- Exposed conductors
- Voltage
- Amperage

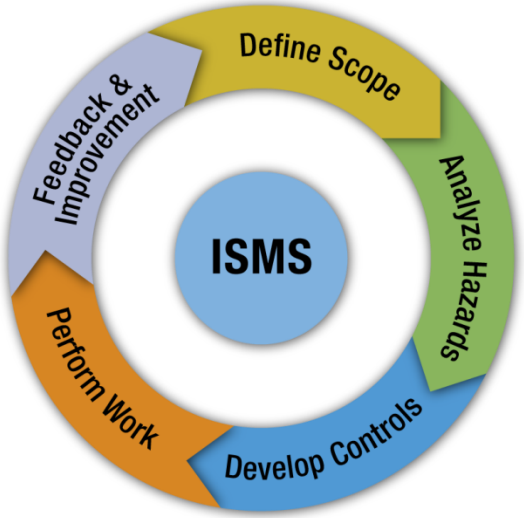
Lockout/Tagout procedure needed/available?

Other non-beam hazards

- Compressed gases
- Chemicals

Co-located hazards

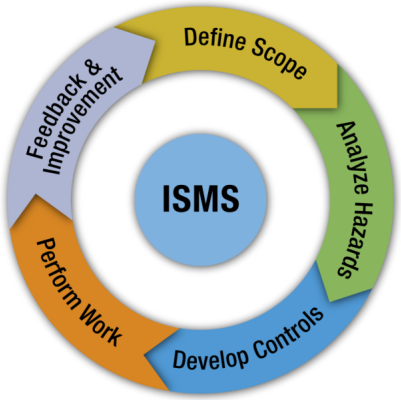
- Other activities in the lab?
- Metals, nanomaterials



Service Subcontractor Questionnaire –

Well in advance – **Send questionnaire to service technician to obtain pertinent info:**

- Laser safety training completed?
- Received training specific to equipment being serviced?
- What is OD of Laser Protective Eyewear at relevant wavelengths?
- What specific tasks will be conducted during visit?
- Does work involve exposure to energized electrical contacts above 50 volts?



Service Subcontractor Questionnaire (cont')

If work involves exposure above 50 volts or requires Lockout/Tagout (LOTO) ask if technician has:

- Received NFPA 70E training
- Received LOTO training
- Proper PPE available for shock/arc flash hazards
- Locks/tags available for LOTO application
- Means to verify zero-energy (volt meter)
- Understanding of process to fully dissipate energy stored in capacitors

Service Subcontractor Questionnaire (cont')

Well in advance – **Use questionnaire as a tool to notify technicians of your expectations:**

- Technicians must bring own laser eyewear
- Technicians expected to wear laser eyewear anytime laser is powered and when beam is not enclosed within Class 1 enclosure
- Tools must be non-reflective
- Need to bring beam-locating devices

Develop Controls - Safe Work Permit

Use questionnaire responses to develop Safe Work Permit

Define Scope of Work in Permit

Specify Hazards and Controls

Work Authorization

Pre-Job Briefing

Provide Site Specific EHS Orientation

Technician verbally overviews scope of work and work plan

Interaction used to assess work practices and experience of technician

Laser eyewear inspected by LSO

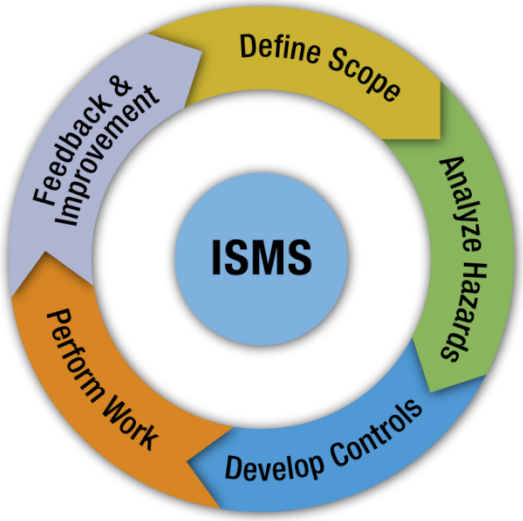
Review provisions of Safe Work Permit

Technician reads and signs permit

Perform Work

After SWP is signed subcontractor is authorized to begin work:

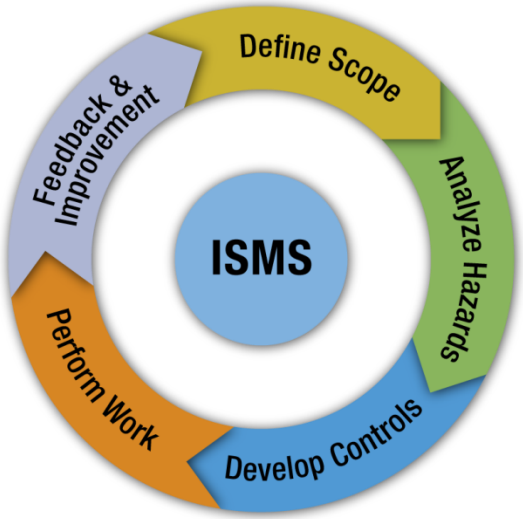
- **Under the direction of the Laser System Supervisor**
- **LSO checks in with subcontractor as needed**



Feedback and Improvement

Post-Job Briefing

- **Meet with Technician after work is completed**
- **Discuss issues and recommendations for improvement in process**



Heed the Warning Signs

Technicians arrive without proper eyewear – indicator that they may not habitually wear LPE

Not knowing the OD's

Not having safety training

Shiny tools

Options – What to Do when you have a sinking feeling

Send them packing

Constant oversight by Laser System Supervisor

Call their employers